

## CLAIMS

1. A data structure for use in timecode representation comprising:  
one or more time measure parameters associated with a media sample and  
which can be used to specify a nominal time associated with the media sample;  
and  
an offset parameter to specify a difference between the time specified by  
the one or more time measure parameters and a represented time associated with  
the media sample.
2. The data structure of claim 1, wherein the one or more time measure  
parameters are defined in terms of SMPTE timecode parameters.
3. The data structure of claim 1, wherein the one or more time measure  
parameters comprise a SMPTE NTSC non-drop or drop-frame timecode.
4. The data structure of claim 1, wherein the one or more time measure  
parameters comprise the following parameters:  
hours, minutes, seconds and frames; or equivalently,  
seconds and frames.
5. The data structure of claim 1, wherein the one or more time measure  
parameters comprise the following parameters:  
hours, minutes, seconds and fields; or equivalently,  
seconds and fields.

1           6.     The data structure of claim 1, wherein the one or more time measure  
2 parameters comprise the following parameters:

3           hours, minutes, seconds, frames, and fields; or equivalently,  
4           seconds, frames, and fields.

5  
6           7.     The data structure of claim 1, wherein the one or more time measure  
7 parameters comprise at least a field parameter that is associated with one or more  
8 fields comprising a media sample frame.

9  
10          8.     The data structure of claim 1 further comprising a discontinuity  
11 parameter configured to specify whether there is a discontinuity at a boundary  
12 between a specific media sample and another specific adjacent sample.

13  
14          9.     A data structure for use in timecode representation comprising:  
15           one or more time measure parameters associated with a media sample and  
16 which can be used to specify a time associated with the media sample; and  
17           an offset parameter defined by a units-per-second denominator factor to be  
18 used to reference the one or more time measure parameters to a represented time.

19  
20          10.    The data structure of claim 9, wherein the offset parameter can be  
21 used to reference the one or more time measure parameters to the true time for  
22 multiple different sampling rates.

1       **11.**    The data structure of claim 10, wherein the sampling rates comprise  
2 rates selected from a group comprising: 24,000/1001 frames per second, 24 frames  
3 per second, 30,000/1001 frames per second, 30 frames per second, 60,000/1001  
4 frames per second, 60 frames per second, and 25 frames per second.

5  
6       **12.**    The data structure of claim 9, wherein the units-per-second  
7 denominator factor can have a general integer value.

8  
9       **13.**    The data structure of claim 9, wherein the units-per-second  
10 denominator factor can have a value of a fixed integer constant divided by a  
11 general integer value, in which the integer constant is an integer multiple of  
12 30,000.

13  
14       **14.**    The data structure of claim 9, wherein the units-per-second  
15 denominator factor can have one or more values, at least one of which is an integer  
16 multiple of 30,000.

17  
18       **15.**    The data structure of claim 9, wherein the units-per-second  
19 denominator factor can have only one value, said value being an integer multiple  
20 of 30,000.

21  
22       **16.**    The data structure of claim 9 further comprising a frame number  
23 parameter which indicates a frame number, and a units-per-frame numerator factor  
24 that can have a general integer value.  
25

1       **17.**   The data structure of claim 9 further comprising a frame number  
2 parameter which indicates a frame number, and a units-per-frame numerator factor  
3 that can have one or more values, at least one of which is an integer multiple of  
4 1001.

5  
6       **18.**   The data structure of claim 9 further comprising a field number  
7 parameter which indicates a field number, and a fields-per-frame parameter which  
8 specifies a number of fields per frame.

9  
10       **19.**   The data structure of claim 18, wherein the number of fields per  
11 frame can have a general integer value.

12  
13       **20.**   The data structure of claim 18, wherein the number of fields per  
14 frame can have one or more values, at least one of which is 2.

15  
16       **21.**   The data structure of claim 18, wherein the number of fields per  
17 frame can have only one value equal to 2.

18  
19       **22.**   The data structure of claim 18 further comprising a units-per-field  
20 numerator factor that can have a general integer value.

21  
22       **23.**   The data structure of claim 18 further comprising a units-per-field  
23 numerator factor that can have one or more values, at least one of which is an  
24 integer multiple of 1001.  
25

1       **24.**    The data structure of claim 9 further comprising a parameter that  
2 indicates a timecode increment counting method comprising SMPTE timecode  
3 non-drop or drop frame counting.

4  
5       **25.**    A data structure for use in timecode representation comprising:  
6 one or more time measure parameters associated with a media sample and  
7 which can be used to specify a time associated with the media sample; and  
8 an offset parameter defined by a:

9               units-per-second denominator factor to be used to reference the one  
10 or more time measure parameters to a represented time, the units-per-  
11 second denominator factor being capable of having one or more values, at  
12 least one of which is an integer multiple of 30,000; and

13              a units-per-frame numerator factor that can have one or more values,  
14 at least one of which is an integer multiple of 1001.

15  
16       **26.**    A data structure for use in timebase representation comprising:  
17 a first parameter associated with a number of basic units of time in the  
18 timebase per second;  
19 second parameter associated with basic units of time to be added for each  
20 field count increment; and  
21 third parameter associated with a number of fields defined for each frame.  
22  
23  
24  
25

1       **27.**    The data structure of claim 26 further comprising a fourth parameter  
2 associated with a method that can be used to compensate frame counting  
3 increments to reduce or eliminate drifts over time between true time and a  
4 timecode timestamp.

5  
6       **28.**    A method of providing a timecode comprising:  
7 providing multiple media samples;  
8 counting the media samples both with respect to media sample frames and  
9 fields within media sample frames; and  
10 timecoding the multiple media samples with a timecode comprising:  
11 values associated with media sample frames,  
12 values associated with fields within media sample frames, and  
13 an offset that can be used to ascertain a represented time associated  
14 with individual fields within the media sample frames.

15  
16       **29.**    A method of providing a timecode comprising:  
17 providing a plurality of media samples at a particular frame rate, the media  
18 samples having associated timecodes; and  
19 offsetting drift associated with the media samples by using an offset  
20 parameter that specifies a difference between a time measure defined by the  
21 associated timecodes and a represented time associated with the media samples.

22  
23       **30.**    The method of claim 29, wherein the frame rate is not an integer  
24 frame rate.  
25

1           **31.**   One or more computer-readable media having computer-readable  
2 instructions thereon which, when executed by a computer, cause the computer to:  
3           provide a plurality of media samples at a particular non-integer frame rate,  
4 the media samples having associated timecodes; and  
5           offset drift associated with the media samples by using an offset parameter  
6 that specifies a difference between a time measure defined by the associated  
7 timecodes and a represented time associated with the media samples.

8  
9           **32.**   A method of processing media samples comprising:  
10          providing one or more media samples individual ones of which have a  
11 timecode; and  
12          calculating a represented time associated with one or more of the media  
13 samples in accordance with the following equation:

14                  $time = x + (\text{frame count} * \text{UPF} + \text{offset}) / \text{UPS}$ , where:

15                  $x$  is a measure of time associated with the media sample and  
16 ascertained from the media sample's timecode;

17                 “frame count” is a value associated with a frame number of  
18 the media sample;

19                 “UPF” comprises a number of basic units of time to be added  
20 for each field count increment;

21                 “offset” specifies a difference between the time represented  
22 by the timecode associated with the media sample and a represented  
23 time; and

24                 “UPS” comprises a number of basic units of time in a  
25 timebase per unit of time.

1  
2       **33.**     The method of claim 32, wherein “x” is associated with a number of  
3 seconds specified by the number of whole seconds represented in a SMPTE  
4 timecode, either as a total number of seconds or as parameters representing hours,  
5 minutes, and seconds.  
6

7       **34.**     The method of claim 32, wherein “offset” is selected as a function  
8 of a true frame rate of the media samples.  
9

10       **35.**    The method of claim 34, wherein the true frame rate comprises a  
11 fractional number of frames per unit of time.  
12

13       **36.**    The method of claim 35, wherein the unit of time comprises  
14 seconds.  
15

16       **37.**    A method of timecoding media samples comprising:  
17       providing one or more media samples having a non-integer frame rate;  
18       timecoding the media samples with a timecode that contains an amount of  
19       drift due to the media samples having the non-integer frame rate; and  
20       incorporating, in the timecode, an offset parameter that can be used to  
21       calculate a reduced-drift time measure that is more accurate than a time measure  
22       taken directly from the timecode.  
23  
24  
25



1       **38.**   The method of claim 37, wherein said timecoding comprises  
2 including a fields parameter that is associated with one or more fields comprising  
3 a media sample frame.

4  
5       **39.**   The method of claim 37, wherein the offset parameter can be used to  
6 calculate a drift-eliminated time measure.

7  
8       **40.**   The method of claim 37 further comprising adjusting the offset  
9 parameter for at least some of the media samples.

10  
11       **41.**   The method of claim 40, wherein said adjusting comprises  
12 determining whether a pre-determined condition has occurred and responsive  
13 thereto, adjusting the offset parameter.

14  
15       **42.**   The method of claim 41, wherein said pre-determined condition is  
16 associated with a seconds counter rolling over.

17  
18       **43.**   The method of claim 41, wherein said pre-determined condition is  
19 associated with whether any frames are dropped.

20  
21       **44.**   The method of claim 41, wherein said adjusting comprises  
22 incrementing the offset parameter by a defined amount.

1       **45.**   The method of claim 41, wherein said adjusting comprises  
2 decrementing the offset parameter by a defined amount.

3  
4       **46.**   The method of claim 41, wherein said adjusting comprises  
5 incrementing the offset parameter by a defined amount, and then at a different  
6 time decrementing the offset parameter by a different defined amount.

7  
8       **47.**   The method of claim 37, wherein said timecode comprises a  
9 SMPTE non-drop counting timecode.

10  
11       **48.**   The method of claim 37, wherein said timecode comprises a  
12 SMPTE drop counting timecode.

13  
14       **49.**   A method of processing media samples comprising:  
15       receiving multiple media samples that have been timecoded with a  
16 timecode that contains an amount of drift due to the media samples having a non-  
17 integer frame rate, the timecode also containing an offset parameter that can be  
18 used to calculate a reduced-drift time measure that is more accurate than a time  
19 measure taken directly from the timecode; and

20       calculating, using the offset parameter, a time measure that is more accurate  
21 than a time measure taken directly from the timecode.

22  
23       **50.**   The method of claim 49, wherein the timecode comprises SMPTE  
24 timecode parameters.

1       **51.**    A method of processing media samples comprising:  
2       providing multiple media samples at a frame rate in which there are a non-  
3 integer number of frames per unit of time associated with a media sample  
4 timecode;  
5       providing an offset parameter that is associated with the timecode and  
6 which describes a difference between the time represented by a timecode and the  
7 represented time; and  
8       using the offset parameter, calculating a represented time associated with  
9 one or more of the media samples.

10  
11       **52.**    The method of claim 51 further comprising adjusting the offset  
12 parameter for at least one of the media samples.

13  
14       **53.**    The method of claim 51 further comprising adjusting the offset  
15 parameter for at least one of the media samples in accordance with occurrence of a  
16 pre-determined condition

17  
18       **54.**    A method of processing media samples comprising:  
19       providing multiple media samples;  
20       counting frames associated with the media samples to provide a frame  
21 count;  
22       counting fields associated with the media samples to provide a field count;  
23       calculating an offset parameter associated with the media samples and  
24 configured for use in calculating a represented time associated with the media  
25 samples; and

1        timestamping one or more of the media samples with a timestamp  
2        comprising a frame count, field count, and offset parameter.

3  
4        **55.**    The method of claim 54, wherein there are two fields per frame for  
5        each media sample.

6  
7        **56.**    The method of claim 54, wherein said timestamping comprises  
8        timestamping the media samples with SMPTE timecode parameters.

9  
10       **57.**    The method of claim 54, wherein said calculating comprises  
11       adjusting an offset parameter value at least once.

12  
13       **58.**    The method of claim 54, wherein said calculating comprises  
14       adjusting an offset parameter value at least once and in accordance with one or  
15       more dropped frames.

16  
17       **59.**    The method of claim 54, wherein said calculating comprises  
18       adjusting an offset parameter value at least once and in accordance with a seconds  
19       counter rolling over.

20  
21       **60.**    The method of claim 54, wherein the represented time can be  
22       calculated in accordance with the following equation:

23       
$$t = x + ((\text{field\_counter} + \text{FPF} * \text{frame\_counter}) \text{UPField} + \text{offset}) / \text{UPS},$$
  
24       where,

25        $x$  is a measure of time associated with a media sample;

1           “frame\_counter” is the frame number associated with a media  
2 sample;

3           “UPField” comprises a number of basic units of time to be added for  
4 each field count increment;

5           “offset” specifies a difference between the time represented by a  
6 timecode associated with the media sample and the represented time; and

7           “UPS” comprises the number of basic units of time in a timebase per  
8 unit of time.

9  
10  
11       **61.**    A method of processing media samples comprising:

12           receiving multiple media samples individual ones of which have been  
13 timestamped with a timestamp comprising a frame count, field count, and offset  
14 parameter, the frame count being associated with a frame number that corresponds  
15 to a media sample, the field count being associated with a field number that  
16 corresponds to a particular frame, and the offset parameter being associated with a  
17 represented time associated with a media sample; and

18           calculating a represented time associated with a media sample using the  
19 offset parameter.

20  
21       **62.**    The method of claim 61, wherein said calculating comprises  
22 calculating the represented time in accordance with the following equation:

23           
$$t = x + ((\text{field\_counter} + \text{FPF} * \text{frame\_counter}) \text{UPField} + \text{offset}) / \text{UPS},$$

24 where,

25            $x$  is a measure of time associated with a media sample;

1           “frame\_counter” is the frame number associated with a media  
2 sample;

3           “UPField” comprises a number of basic units of time to be added for  
4 each field count increment;

5           “offset” specifies a difference between the time represented by a  
6 timecode associated with the media sample and the represented time; and

7           “UPS” comprises the number of basic units of time in a timebase per  
8 unit of time.

9  
10       **63.**   A method of processing media samples comprising:

11       receiving media samples that were sampled using a first format, and  
12 broadcast using a second format which constitutes separating fields from frames of  
13 the first format, the media samples comprising individual frames each with  
14 multiple fields, the media samples further comprising a timecode value associated  
15 with each individual field, the timecode comprising an offset parameter that  
16 specifies a difference between the time represented by a timecode value associated  
17 with the media sample and the represented time; and

18       with the media samples in the second format, calculating a represented time  
19 associated with one or more of the fields in the first format.

20  
21       **64.**   A counting compensation method comprising:

22       determining a time value associated with a frame count increment for a  
23 media sample;

24       computing accumulated drift between a timecode associated with multiple  
25 media samples and true time; and

1 occasionally skipping a maximum frame number, while counting frames, to  
2 reduce the accumulated drift.

3  
4 **65.** A counting compensation method as in claim 64, in which the  
5 maximum frame number is skipped when the accumulated drift exceeds the time  
6 represented by a frame count increment.

7  
8 **66.** A counting compensation method comprising:  
9 determining a time value associated with a frame count increment for a  
10 media sample;  
11 computing accumulated drift between a timecode associated with multiple  
12 media samples and true time; and  
13 occasionally skipping a minimum frame number, while counting frames, to  
14 reduce the accumulated drift.

15  
16 **67.** A counting compensation method as in claim 66, in which the  
17 minimum frame number is skipped when the accumulated drift exceeds the time  
18 represented by the frame count increment.